REMARKS / ARGUMENTS

These remarks are responsive to the Office Action dated March 21, 2006. Claims 1-15, 18-28, and 31-36 remain pending in the present application. Claims 1-36 are rejected. Claims 1-3, 14, 22, 25, 27and 34 have been changed, and claims 16, 17, 29, and 30 have been canceled by this amendment.

Specifically, Applicant has amended independent claims 1, 14, and 27 to recite that the error that has occurred is an unrecoverable error, and that state of the integrated circuit is saved when the internal clocks of the integrated circuit have been stopped. These features were disclosed in the originally-filed application as dependent claims, such as claims 3, 16, and 17, and in the specification, e.g., page 10. Dependent claims have been amended to be consistent with independent claims and for clarity.

102 Rejections

The Examiner rejected claims 1, 2, 6, 8, 10, 13-15, 17-20, 23, 25-28, 30-33 and 35 under 35 U.S.C. 102(b) as being anticipated by Vachon, U.S. Patent Application Publication No. 2002/0078404A1 ("Vachon '404"). Applicant respectfully traverses, and has amended the independent claims to clarify Applicant's invention.

Vachon '404 discloses a system which execution of a core operating system on a target computer is stopped after an internal fault condition in the operating system occurs, and a debugger program transfers contents of the physical memory of the target computer to a host computer over a serial bus for debugging. The user then uses the debugger to command that execution of the operating system is resumed.

In contrast, claim 1 recites a system for saving the state of an integrated circuit, including a

non-volatile memory and a state-saving controller that saves the state of the integrated circuit to the non-volatile memory when an unrecoverable error occurs in the integrated circuit and the internal clocks of the integrated circuit have been stopped so that latches of the integrated circuit retain their states upon the error in the operation of the integrated circuit. Vachon '404 does not disclose or suggest a state-saving controller that saves the state of an integrated circuit to a non-volatile memory when an unrecoverable error occurs in the integrated circuit and the internal clocks of the integrated circuit have been stopped.

In Vachon '404, an internal fault condition occurs and a user issues a command to a host debugger to halt "normal" execution of the core operating system of the target computer (page 3, para. 0038). After receiving identifying information during a handshaking procedure and taking the memory snapshot, the user issues a command to the debugger to instruct the operating system to resume execution (page 4, para. 0038, line 9).

Thus, Vachon '404 is taking a snapshot of the state of software, such as the operating system, and not hardware such as a particular integrated circuit. Vachon's memory snapshot is performed by receiving state information from the core operating system, and using that state information to identify the address ranges in the physical memory, to preserve the state of the core operating system (page 4, para. 0040, lines 20-22). Vachon '404 therefore simply copies out portions of memory to save the state of software, and does not save the state of an integrated circuit, as recited by Applicant.

Secondly, the target computer hardware that experienced the internal failure of the operating system is still operating in Vachon '404, and can perform tasks for the user after the failure. For example, the target computer and core operating system of the target computer provide state information to a debugger in a handshaking operation after the operating system execution is halted (page 4, para. 0039), indicating that the internal clocks of the integrated circuits of Vachon's target computer are still

operating so that this operation can be performed. In contrast, in Applicant's invention the internal clocks of the integrated circuit have been stopped before the state-saving controller saves the state of the integrated circuit. This allows the state of the latches of the integrated circuit to be saved in the proper state, since Applicant's invention is directed to saving the state of an integrated circuit, not software. Vachon '404 discloses no such step since Vachon is reading memory that described a state of software that has failed.

Finally, Vachon's target system is recoverable after its internal failure. This is indicated by the ability of the debugger to interface with the target system, and is also indicated by the ability of Vachon's debugger to instruct the core operating system of the target computer to resume execution. Vachon's system therefore has not experienced an unrecoverable error. In contrast, Applicant's invention is directed to saving the state of an integrated circuit when an unrecoverable error occurs in an integrated circuit. Furthermore, this unrecoverable error has occurred in an integrated circuit, and is not a failure of an operating system as disclosed in Vachon '404.

Applicant therefore believes that claim 1 is patentable over Vachon '404. Claims 2, 6, 8, 10, and 13 are dependent from claim 1 and are patentable over Vachon '404 for at least the same reasons as claim 1, and for additional reasons. For example, claim 2 recites that the state of substantially all the latches of the integrated circuit are saved to the non-volatile memory; as explained above, Vachon '404 does not disclose or suggest saving the state of an integrated circuit, such as the integrated circuit's latches, but instead saves the state of software as stored in memory. Claim 13 recites that the saved state includes data contents of registers and other latches of the integrated circuit, which is not disclosed or suggested by Vachon '404 for similar reasons.

Claim 14 recites a method for saving the state of an integrated circuit, including determining that an unrecoverable error has occurred in the operation of the integrated circuit, and saving the state of

the integrated circuit to a non-volatile memory, the state saved after the unrecoverable error has been detected and after the internal clocks of the integrated circuit have been stopped so that the latches retain their states upon the unrecoverable error in the operation of the integrated circuit. As explained above with reference to claim 1, Vachon '404 does not disclose or suggest saving the state of an integrated circuit to a non-volatile memory after an unrecoverable error is detected in the operation of an integrated circuit and the internal clocks of the integrated circuit have been stopped. Claims 15, 17-20, 23, and 25-27 are dependent on claim 14 and are therefore patentable over Vachon '404 for at least the same reasons as claim 14, and for additional reasons. For example, claim 18 recites that an error flag is asserted after the state of the integrated circuit has been saved; Vachon '404, in contrast, does not disclose any such error flag; the internal failure of Vachon's system is identified before the memory snapshot is taken place (page 3, para. 0034). The Examiner's citation of paragraph 38, last seven lines, describes resuming execution after the memory dump is completed, which is not the assertion of an error flag; it is simply the resumption of normal operation of the operating system. Claim 25 recites that the state of the integrated circuit is saved automatically upon the unrecoverable error; this is not disclosed or suggested in Vachon '404, which requires a user to manually provide commands to a debugger to take a snapshot of memory contents.

Claim 27 recites a computer storage medium including program instructions implementing steps for saving the state of an integrated circuit, such steps similar to the method of amended claim 14. Applicant therefore believes that claim 27 is patentable over Vachon '404 for at least the same reasons as claim 14. Claims 28, 30-33 and 35 are dependent from claim 27 and are patentable over Vachon '404 for at least the same reasons as claim 27, and for additional reasons as explained above.

In view of the foregoing, Applicant believes that claims 1, 2, 6, 8, 10, 13-15, 17-20, 23, 25-28, 30-33 and 35 are patentable over Vachon '404, and respectfully requests that the rejection under 35

U.S.C. 102(b) be withdrawn.

103 Rejections

The Examiner rejected claims 3, 9, 11, 16, 24, 29, and 36 under 35 U.S.C. 103(a) as being unpatentable over Vachon (U.S. Patent Application Publication No. 2002/0078404) ("Vachon '404") in view of Vachon (U.S. Patent No. 6,681,348) ("Vachon '348"). Applicant respectfully traverses, and has amended the claims to clarify Applicant's invention.

With respect to claim 3, the Examiner stated that Vachon '404 fails to disclose that the failure is an unrecoverable error, but that Vachon '348 discloses that crash dump files are generated when the system physically crashes at col. 1, lines 14-30, and so it would be obvious to use the crash dump files for various types of errors, including crashes. However, similar to Vachon '404 as explained above, Vachon '348 is not disclosing an integrated circuit or hardware as "crashing"; rather, it is the operating system and/or other software that crashes. Vachon '348 discloses dumping the contents of physical memory into a crash dump, a file generated when the operating system recognizes an internal failure (col. 2, lines 20-24). The crash dump file is of software, such as an operating system or kernel memory dump, or an application program (col. 2, lines 42-46). In Vachon '348, a machine crashes typically due to errors occurring in the kernel mode portion of physical memory (col. 4, lines 47-51). Thus, as in Vachon '404, Vachon '348 describes software crashes, not an unrecoverable error in an integrated circuit.

In addition, Vachon's "crashes" do not have the internal clocks of integrated circuits stopped, nor are the crashes an unrecoverable error of an integrated circuit. This is indicated by the disclosure that the computer hardware that experienced the failure is still operating, and can perform tasks for the user after the crash. For example, a crash dump process 26 (Fig. 1) still operates after a crash to provide

a crash dump file; the crash dump process is running on the hardware of the system 10, and/or a main operating system process running on the local machine 10 can invoke crash dump routines on that machine (col. 5, lines 8-11; col. 7, lines 53-56). An extraction tool running on the machine extracts data after the crash (col. 5, lines 20-30), indicating that the internal clocks of the machine 10 are still running and that the integrated circuits of the machine 10 have not had unrecoverable errors, since software may still be executed on the machine. In contrast, in Applicant's invention an unrecoverable error has occurred in the integrated circuit, and the internal clocks of the integrated circuit have been stopped. This allows the state of the latches of the integrated circuit to be saved in the proper state, since Applicant's invention is directed to saving the state of an integrated circuit. Since neither Vachon '404 nor Vachon '348 disclose or suggest the cited features of claims 1 and 3, Applicant believes that claim 3 is patentable.

Claims 9 and 11 are also dependent on claim 1 and are patentable over Vachon '404 in view of Vachon '348 for at least the same reasons as claims 1 and 3.

Claim 24 is dependent from claim 14, which is believed patentable over Vachon '404 and Vachon '348 for at least similar reasons to those explained above for claims 1 and 3. Claim 24 is therefore patentable over these references for at least the same reasons as claim 14.

Claim 36 is dependent from claim 27, which is believed patentable over Vachon '404 and Vachon '348 for at least similar reasons to those explained above for claims 1 and 3. Claim 36 is therefore patentable over these references for at least the same reasons as claim 27.

In view of the remarks above, Applicant submits that the pending claims are patentable over Vachon '404 in view of Vachon '348, and respectfully requests that the rejection of claims 3, 9, 11, 24, and 36 under 35 U.S.C. 103(a) be withdrawn.

The Examiner rejected claims 4 and 21 under 35 U.S.C. 103(a) as being unpatentable over Vachon (U.S. Patent Application Publication No. 2002/0078404) ("Vachon '404") in view of Powley (European Silicon Structures Limited: The Beginner's Guide to ASICs). Applicant respectfully traverses. Claims 4 and 21 are dependent from claims 1 and 14, respectively, and are patentable over Vachon '404 in view of Powley at least for reasons similar to those explained above for claims 1 and 14. For example, Vachon '404 discloses software crashes and mentions and suggests nothing about dealing with stopped internal clocks and integrated circuit unrecoverable errors as recited by Applicant. Applicant therefore respectfully requests that the rejection of claims 4 and 21 under 35 U.S.C. 103(a) be withdrawn.

The Examiner rejected claim 5 under 35 U.S.C. 103(a) as being unpatentable over Vachon (U.S. Patent Application Publication No. 2002/0078404) ("Vachon '404") in view of Microsoft Computer Dictionary (fifth edition). Applicant respectfully traverses. Claim 5 is dependent from claim 1 and is patentable over Vachon '404 in view of Microsoft Computer Dictionary at least for reasons similar to those explained above for claim 1. Applicant therefore respectfully requests that the rejection of claim 5 under 35 U.S.C. 103(a) be withdrawn.

The Examiner rejected claims 7, 12, 22, and 34 under 35 U.S.C. 103(a) as being unpatentable over Vachon (U.S. Patent Application Publication No. 2002/0078404) ("Vachon '404") in view of Masuyama (U.S. Patent Application Publication No. 2003/0145142) ("Masuyama"). Applicant respectfully traverses. Claims 7, 12, 22, and 34 are dependent from claims 1, 14, and 27, respectively, and are believed patentable over Vachon '404 in view of Masuyama at least for reasons similar to those explained above for claims 1, 14, and 27. Masuyama, similarly to Vachon '404, describes operating

system crashes (e.g., page 1, para. 0003), not internal clocks stopped and unrecoverable errors of an integrated circuit as recited by Applicant. Applicant therefore respectfully requests that the rejection of claims 7, 12, 22, and 34 under 35 U.S.C. 103(a) be withdrawn.

Applicants' attorney believes this application in condition for allowance. Should any unresolved issues remain, Examiner is invited to call Applicants' attorney at the telephone number indicated below.

Respectfully submitted,
SAWYER LAW GROUP LLP

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Date

Joseph A. Sawyer, Jr.
Attorney for Applicant(s)
Reg. No. 30,801
(650) 493-4540